A Case of Gas-Forming Liver Abscess with Diabetes Mellitus

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Abstract

A 43-year-old man was admitted to our hospital with right hypochondriac and epigastric pain. An abdominal radiograph showed a large niveau in the right subphrenic space. An abdominal CT scan demonstrated a large liver abscess (diameter, 13 cm) with gas formation. *Klebsiella pneumoniae* cells were isolated from the abscess, and the patient was treated with antibiotics and percutaneous drainage. It is very important to treat gas-forming liver abscess immediately, because subsequent bacteremia and septic shock are frequently noted, and the associated mortality rate is high.

Key words: Gas-forming pyogenic liver abscess (GFPLA), diabetes mellitus, *Klebsiella pneumoniae*

(Intern Med 50: 2329-2332, 2011)

(DOI: 10.2169/internalmedicine.50.5686)

Introduction

Gas-forming pyogenic liver abscess (GFPLA) accounts for 7% to 32% of pyogenic liver abscess (PLA) cases (1). GFPLA is commonly associated with underlying diabetes mellitus (DM). *Klebsiella pneumoniae* (*K. pneumoniae*) is the most frequent causative bacteria cultured from blood culture and liver aspirates (1). It is very important to treat GFPLA immediately, because bacteremia and septic shock frequently occur in GFPLA patients and the mortality rate is high, which accounts for 27.7% to 37.1% (1). We report a case of GFPLA with poorly controlled DM who was treated immediately without complications such as endophthalmitis or meningitis.

Case Report

A 43-year-old man was admitted to our hospital with right hypochondriac and epigastric pain for several days. His abdomen was soft, and right hypochondriac and epigastric tenderness was observed. Laboratory data at admission were as follows: aspartate aminotransferase (AST), 149 IU/L (normal range 8-38); alanine aminotransferase (ALT), 171

IU/L (normal range 4-44); alkaline phosphatase, 602 IU/L (normal range 104-338); γ -glutamyl transpeptidase, 104 IU/L (normal range 8-60); white blood cell count, 19,820/mm³ (normal range 4,000-8,000); C-reactive protein, 26.39 mg/dL (normal range <0.3); fasting blood glucose level, 406 mg/dL (normal range 70-110); hemoglobin A1c, 14.3% (normal range 4.3-5.8). He had taken 25 g/day of alcohol for 23 years. There was no history of chronic obstructive pulmonary disease or glucocorticoid therapy.

A chest radiograph showed a large niveau in the right subphrenic space (Fig. 1). Ultrasonography (US) showed an arch-shaped high echoic lesion with an acoustic shadow (Fig. 2). Abdominal computed tomography (CT) scan demonstrated a large liver abscess with gas formation, and diameter of the abscess was measured as 13 cm (Fig. 3a). We diagnosed the patient with GFPLA and admitted him to our hospital on the same day.

We performed percutaneous transhepatic abscess drainage (PTAD) with a 7 French (Fr) pig tail tube, and 40 mL of brown pus and a large quantity of air were excreted. We started the treatment with broad spectrum intravenous antibiotics (1 g/day meropenem) and intravenous insulin.

Abdominal CT performed on the day after admission demonstrated that the diameter of the abscess had become

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Received for publication April 21, 2011; Accepted for publication July 1, 2011

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Figure 1. a: Chest X-ray film on admission shows a large niveau in the right subphrenic space. b: The niveau disappeared after PTAD.

Figure 2. Ultrasonography on admission shows an arch-shaped high echoic lesion with an acoustic shadow.

Figure 3. a: Abdominal computed tomography (CT) on admission shows a large liver abscess with gas formation, and the abscess was measured as 13 cm in diameter. b: Abdominal CT on 43 days after admission revealed that gas in the abscess disappeared and the size of the abscess was reduced to 3 cm in diameter.

reduced to 10 cm, and fever and abdominal pain were improved. *K. pneumoniae* was cultured from pus and blood: the culture showed a high sensitivity to meropenem. Thus, the treatment with intravenous meropenem was continued. At 6 days after admission, abdominal CT revealed that the size of the abscess did not change even though it was wrapped by the capsule. Therefore, we replaced the 7-Fr pig tail tube with an 8-Fr tube with side holes.

Because the abscess was gradually reduced, we changed the antibiotics to oral administration of ciprofloxacin 400 mg/day at 15 days after admission. Disappearance of the niveau was confirmed by chest radiograph (Fig. 1b). An abdominal CT on performed on day 29 revealed that the gas in the abscess had disappeared, and the diameter of the abscess was reduced to 4 cm. The tube was removed at 34 days after admission. On the day 43, the size of the abscess was reduced to 3 cm (Fig. 3b), and the patient was discharged the next day. Administration of the antibiotic was stopped on day 65 because the abscess was no longer visible on abdominal CT. The blood glucose level has been well-controlled during the treatment period, and there has

been no clinical evidence of recurrence. Although GFPLA has been associated with the risk of digestive malignancies, esophago-gastro-duodenoscopy performed on day 31 revealed no malignancy as well as repeated abdominal US and CT. Total colonoscopy was not performed because fecal occult blood test and abdominal CT yielded negative results.

Discussion

PLA is an uncommon disease, accounting for 8 to 25

Table 1. Laboratory Data on Admission

Hematology			Blood chemistry		Serology	
WBC	19820	/mL	TP	6.6 g/dL	HBsAg	(-)
RBC	483×10 ⁴	/mL	Alb	2.5 g/dL	HCV-Ab	(-)
Hb	14.2	g/dL	T-bil	0.86 mg/dL		
Hct	41	%	AST	149 U/L	Tumor marker	
Plt	35.2×10 ⁴	/mL	ALT	171 U/L	CEA	3.9 ng/mL
ESR	100	mm/h	LDH	353 U/L	CA19-9	18.8 U/mL
			ALP	602 U/L		
Coagulation			γ-GTP	104 U/L		
PT	57	%	BUN	18 mg/dL		
APTT	23.8	sec	Cre	0.59 mg/dL		
			Na	129 mEq/L		
Urinalysis			K	4.76 mEq/L		
pH	5.5		Cl	87 mEq/L		
Protein	(±)		BS	406 mg/dL		
Sugar	(4+)		HbA1c	14.3 %		
Blood	(-)		CRP	26.39 mg/dL		
Acetone	(3+)					
Bilirubin	(-)					
Urobilinogen	(±)					

WBC white blood cell, RBC red blood cell, Hb hemoglobin, Hct hematocrit, Plt platelets, ESR erythrocyte sedimentation rate, PT prothrombin time, APTT activated partial thromboplastin time, Alb Albumin, T-bil total bilirubin, AST aspartate aminotransferase, ALT alanine aminotransferase, LDH lactate dehydrogenase, ALP alkaline phosphatase, γ-GTP g-glutamyl transpeptidase, BUN blood urea nitrogen, Cre creatinine, BS blood sugar, HbA1c hemoglobin A1c, CRP C-reactive protein, HBsAg hepatitis B surface antigen, HCV-Ab hepatitis C antibody, CEA carcinoembryonic antigen, CA19-9 carbohydrate antigen 19-9

cases per 100,000 hospital admissions (1). PLA is divided into 7 groups on the basis of the infection route: portal vein route, liver artery, biliary tract, direct route, injury, iatrogenic, and idiopathic routes. Among these, the biliary tract route is the most frequent route, 60% of PLA cases occur via biliary tract (2). Ultrasonography has been successful for the diagnosis of PLA in 95% of the cases, and almost all the cases can be diagnosed by CT (2-4). GFPLA accounts for 7% to 32% of PLA cases. It has been reported that of the 69 patients who had PLA, 22 had GFPLA, and 21 had DM (1). *K. pneumoniae* is the most common pathogen of PLA, which accounts for 70% of GFPLA (1).

Hyperglycemia is an important factor for GFPLA. Poor control of DM leads to compromised immunity, and neutrophil dysfunction and chemotaxis dysfunction. These provide a favorable microenvironment for the rapid growth and vigorous metabolism of the bacteria, which in turn may lead to gas production (5). Local tissue damage caused by gas-forming bacteria and compounded by the diabetic microangiopathy would markedly retard the transport of catabolic end products away from the lesion and thereby results in gas accumulation (1). The present patient also had poorly-controlled DM, which would play a role in the development of GFPLA.

Metastatic infection including endophthalmitis and meningitis are more frequent in the *K. pneumoniae* GFPLA than in the non-*K. pneumoniae* GFPLA (6). Because two-thirds of PLA patients had permanent vision loss, physicians should consult an ophthalmologist rapidly whenever a diag-

nosis of PLA caused by *K. pneumoniae* is made. In the present case, we consulted an ophthalmologist on the day after admission, and the patient had no endophthalmitis or DM-associated retinopathy.

Among patients with PLA, the incidence of septic shock and bacteremia is higher in GFPLA patients compared to non-GFPLA patients. Septic shock is noted in 32.5% of patients with GFPLA and in 11.7% of patients with PLA patients (7). GFPLA also has a high fatality rate which is around 27.7% to 37.1% (1). GFPLA also ruptures easily because of tissue invasion and fragility of abscess wall, and further gas formation increases the internal pressure of the abscess (8). In previous studies, spontaneous rupture of PLA had occurred in 7.1% to 15.1% of the cases (9) and 20 of 24 patients with ruptured PLA had GFPLA (8). To treat GFPLA, PTAD is usually performed to evacuate the purulent material inside the abscess if the abscess size is larger than 5 cm along with the administration of intravenous antibiotics (2). Indications for the removal of the tube are negative culture results, and a daily drainage output of less than 5 mL (6). Although some large abscesses do not disappear completely, the risk of recurrence is very low if the tube is removed after the improvement in inflammation. In the present case, we removed the tube when the diameter of the abscess on the scan was 4 cm and no recurrence was observed to date.

We should select antibiotics to target gram-negative bacilli such as *K. pneumoniae* and *E. coli*. Because treatment results were similar between patients treated with extended-

spectrum cephalosporins and those treated with a combination of first-generation cephalosporins and aminoglycosides, treatment with the latter is recommended for patients without risk factors such as endophthalmitis and meningitis (10).

In conclusion, we report a case of GFPLA who was treated immediately with PTAD and intravenous administration of an antibiotic and had a good course without complications such as endophthalmitis and/or meningitis.

The authors state that they have no Conflict of Interest (COI).

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